

LIMITED CIRCULATION

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Agricultural Memorandum No 1008

A COMPARISON OF THE ROUTINE T-SUM SERVICES OF THE METEOROLOGICAL OFFICE AND OF FARMERS WEEKLY IN 1983.

Summary

T-Sums estimated by the Met Office and by Farmers Weekly are compared. The former were based on temperatures corrected to sea level while the latter used temperatures as measured which hence applied to some (unknown) height above sea level. As a result the T-Sums of the Met Office accumulated more rapidly (and therefore reached a total of 200 earlier) than those of FW. This difference was enhanced by the spell of cold weather starting in February.

The Met Office product was available more rapidly and used observations of a uniform high standard; many more observations, but of a more variable quality, were available to FW.

The plans of FW for their 1984 service indicate considerable improvement to that service.

1. Introduction

In January 1983 both the Meteorological Office and the magazine Farmers Weekly started a routine service providing accumulated 'T-sums' for a network of grid squares covering Britain. The purpose of this note is to compare, briefly, the values given by each service.

The wider question of the use of T-Sums as a guide for nitrogen application is not considered.

2. T-Sums

The daily increment to the T-Sum is the mean daily temperature, unless this value is negative - when no increment is made.

The T-Sum on a given date is the total of the daily increments since 1 January.

3. Methods

(i) Met Office The Met Office used the MORECS data set which contained daily estimates of mean temperatures at the centres of each (40 km x 40 km) square of a network covering Britain - a total of 190 squares. The estimates were made using daily data from about 150 observing stations. Mean temperatures at each station were calculated according to either (a) $T_{\text{mean}} = \frac{1}{2} (T_{\text{max}} + T_{\text{min}})$ or (b) $T_{\text{mean}} = \frac{1}{4}$ (sum of temperatures at 03,

09, 15 and 21 hrs), depending upon which observations were available. After reduction to sea level (assuming a lapse of 0.6°C per 100 m) values of mean sea level temperature at the centre of each square were estimated by interpolation from the nearest six sites having observational data.

Maps of T-Sums were produced every Wednesday - each map showing the accumulation up to the previous Tuesday. The results were transmitted to customers by telex on Wednesday afternoon.

Figure 1 shows the map for Tuesday 15 Feb 1983; the upper number in each square is the T-Sum at sea level at the centre of the square; the number below is an altitude correction; the number in the lower left hand corner is the square identifier.

The estimated T-Sum at a given site is

$$\left[\begin{array}{c} \text{sea level value} \\ \text{derived from map} \end{array} \right] = \left[\begin{array}{c} \text{altitude correction} \times \text{site altitude (metres)} \\ 100 \end{array} \right]$$

This can be illustrated by a calculation for Hawkridge which is near the centre of Square 166, at 314 m above sea level:

$$\text{Estimated T-Sum} = 272 - \frac{24 \times 314}{100} = 197 \text{ degree-days}$$

(ii) Farmers Weekly Farmers Weekly also presented their results in a grid square (approx 50 km x 50 km) format. Daily observations of max/min temperatures from about 700 amateur observers were used. Local T-Sums were collected and collated by UKF (U.K. Fertilizers Ltd) regional managers who 'balanced' the figures to provide a single representative value for their particular grid squares.

Maps of T-Sums were published (in the magazine) each Friday and showed accumulations up to the previous Friday.

Figure 2 shows the map for Friday 18 Feb 1983 (published on Friday 25 Feb 1983).

4. Comparison

Comparison is slightly complicated by the differing dates of publication (Wednesdays and Fridays) and the differing grids (40 km or 50 km squares). Figure 3 shows the Farmers Weekly (FW) grid superimposed on the Met Office grid.

Figures 4a-4s show graphs of weekly values of the two sets of T-Sums for Jan-Feb/Mar 1983 for grid squares that are approximately coincident.

It can be seen that the Met Office T-Sums are consistently greater than those of FW.

5. Discussion

5.1 Differences between T-Sum Values

The consistent difference mentioned above is obviously at least partly due to the fact that the Met Office uses sea level temperatures which are higher than FW's temperatures (which refer to the mean height of the sites used). No information on this mean height (which may have varied from week to week depending upon the reliability of the observers) was published although in January 1983 the magazine said '... in hilly areas the figures are taken on lowland sites and altitude adjustments must be made'.

A consequence of this difference is that Met Office T-Sums reach 200 earlier than do those of FW. In the examples considered (figs 4a-4s) the differences range from about 2 days (fig 4a) to more than 30 days (Fig 4l).

In this particular season the difference was enhanced by the cold spell of February 1983: Met Office T-Sums in many places had reached 200 but FW T-Sums had generally not and suffered further delay by the cold weather - Fig 4e shows a good example.

A further (and probably small) contribution to the consistent difference is evident when T-Sums (at a particular site) estimated from the Met Office maps are compared with T-Sums measured at the same sites. In such a comparison (for Wales and SW England) Sparks (1983) found the estimated values '... were slightly higher than the observed values even at synoptic stations whose data were used in preparation of the maps...'. However, he found the differences to be '...small and of no practical significance except possibly at Moel Cynnedd and Rhoose'. Figure 5 shows the estimated and observed T-Sums for these stations for Jan to Feb/Mar 1983; in both cases the difference between the two curves is generally much smaller than the differences between the Met Office and FW T-Sums plotted in figs 4a-4s.

The source of this small but consistently one sided difference between observed and measured T-Sums is not completely clear but possible factors are:

- (a) the assumed constant lapse rate ($0.6^{\circ}\text{C}/100\text{m}$) may have been slightly larger than that which was actually applicable during the period;
- (b) there is a small systematic difference between the methods ((a) and (b) in section 3) used to calculate the daily increment. (For example at Heathrow, in January, it is known that method (b) gives a warmer figure by about 0.23°C (with s.d. 1.0°C));
- (c) the extent of urbanization of some of the Met Office observing sites. This is particularly true of some of the Weather Centres where mean daily temperatures seem to be around 0.5°C warmer than surrounding areas. (Data from these stations is being considered, with a view to excluding them from the calculations).

The final factor above is perhaps the reason for the difference between estimation and observation seen at Rhoose - the estimated values are strongly influenced by data from Cardiff Weather Centre, which is near the centre of square 156.

The net result of this small excess of estimated over observed T-Sums is to make the estimated date of reaching a T-Sum value of 200 too early by, generally, a day or two and by 6 days and 3 days in the cases of Moel Cynnedd and Rhose respectively. These errors are small when compared to the differences between the Met Office and FW methods, where the differences, as already mentioned range from 2 to more than 30 days (figs 4a-4s).

5.2 Dissemination

A clear disadvantage of the FW system is the delay of 1 week between measurements being made and being published. This compares poorly with the Met Office's delay of about 1 day.

5.3 Density of Observing Network

Compared with the FW network, that of the Met Office seems sparse. Some of the squares in the Met Office product contain no observing station. However, the actual distribution of FW sites is not known; it may also have large gaps but in general the sites probably reflect (in terms of their horizontal and vertical distribution) the agricultural interest in T-Sums.

The large number of measuring sites available to FW suggests the possibility of using a finer network of grid squares - perhaps confined to certain parts of the country.

5.4 Quality of Observations

The Met Office observations are made using instruments, exposures and observers of a fairly uniform high standard.

The observations for FW are probably considerably more mixed in these respects but this may be overcome by the greater number of observations available - small errors may cancel and large errors would hopefully be detected by the UKF regional managers.

6. Conclusions

T-Sums produced by the Met Office have been compared with those produced by Farmers Weekly. The former accumulated more rapidly, mainly due to the use of sea level temperatures compared to the latter's use of temperatures at some (unknown) height. In this particular season the weather was such that this feature led to considerable differences in the date of achieving a T-Sum of 200.

The Met Office product is subject to considerably less delay before reaching the customers.

The Farmers Weekly product is based on many more observations (but of a more variable quality) than that of the Met Office. (It is interesting to note that in 1984, Farmers Weekly plans to:

- (i) include N Ireland in its service
- (ii) increase the number of observers to more than 800

(iii) give altitude data to enable corrections to be made.

(iv) reduce the delay from 7 days to 4 days.

These plans should offset some of the problems described above and will also extend the service over a larger area than that covered by the Met. Office).

Reference

Sparks, W. R., 1983; A Comparison of On-Site Observations of T-Sums with Values Interpolated from Synoptic Weather Data.
Agricultural Memorandum No 993 (unpublished).

Any comments or suggestions on this paper should be addressed to the author.

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FIGURE 1

TSUM FROM 1/1/83 TO 15/2/83

ORKNEYS AND SHETLANDS

196
26
197
27

SQUARE 166

KILOMETRES
0 20 40 60 80 100

NATIONAL GRID

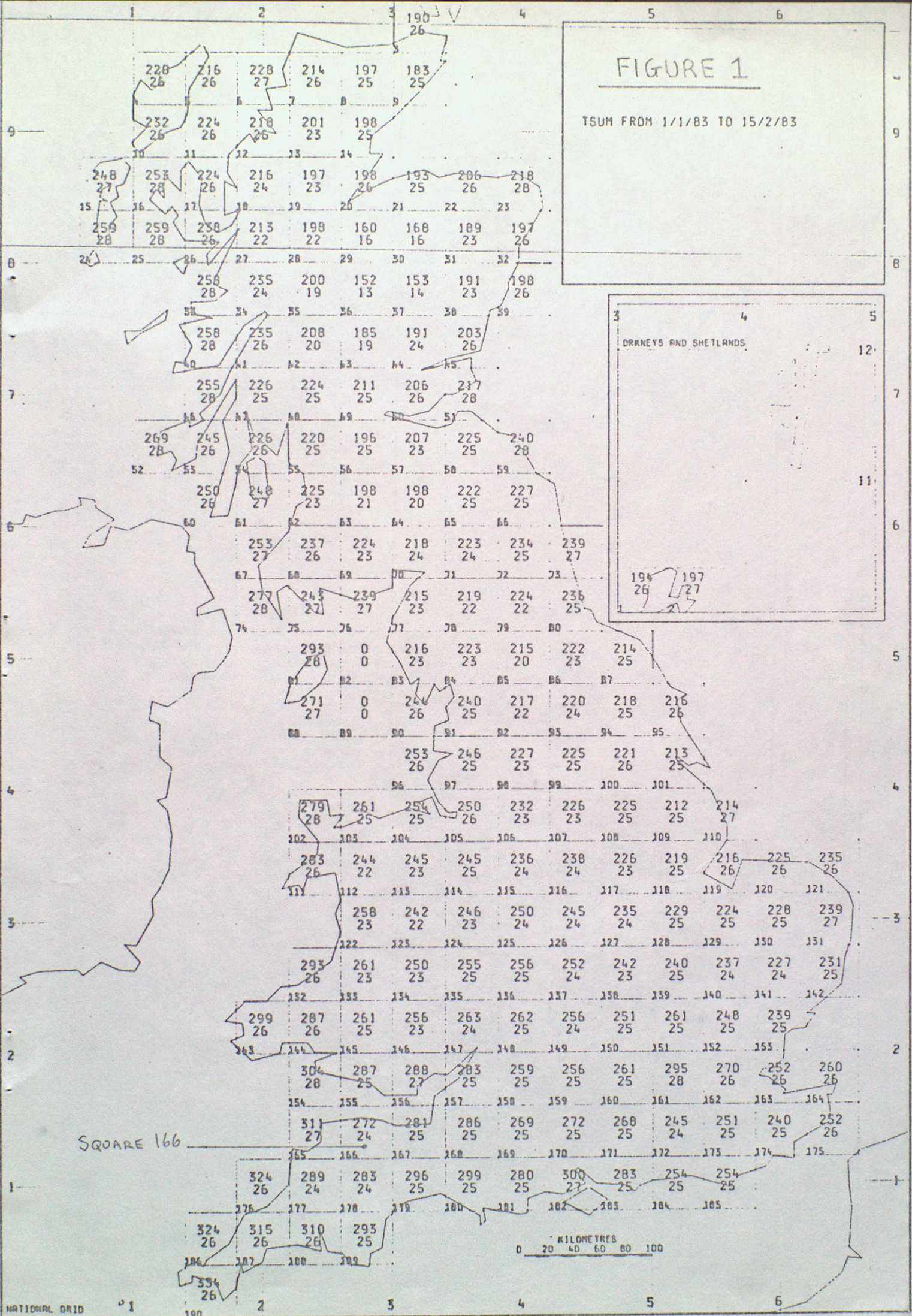
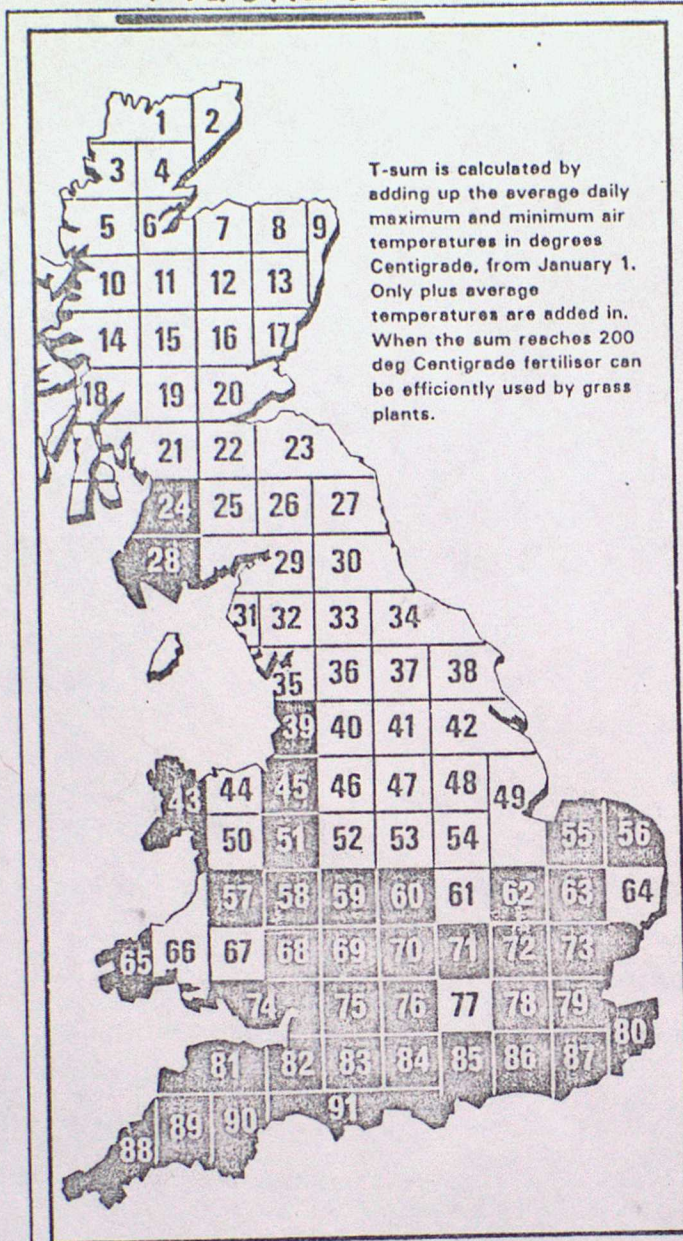


FIGURE 2



T-SUM TOTALS TO FEBRUARY 18

Square	T-sum	Square	T-sum	Square	T-sum	Square	T-sum
1	126	35	188	69	X	81	X
2	141	36	140	70	X	82	X
3	133	37	158	71	X	83	X
4	130	38	156	72	X	84	X
5	127	39	X	73	X	85	X
6	154	40	164	74	X	86	X
7	173	41	179	75	X	87	X
8	142	42	171	76	X	88	X
9	161	43	X	77	196	89	X
10	128	44	157	78	X	90	X
11	109	45	X	79	X	91	X
12	100	46	140	80	X		
13	145	47	152				
14	143	48	184				
15	133	49	180				
16	143	50	159				
17	183	51	X				
18	147	52	177				
19	151	53	180				
20	174	54	162				
21	132	55	X				
22	145	56	X				
23	181	57	X				
24	X	58	X				
25	129	59	X				
26	125	60	X				
27	180	61	187				
28	X	62	X				
29	185	63	X				
30	175	64	198				
31	181	65	X				
32	181	66	196				
33	157	67	161				
34	172	68	X				

X=T-sum 200 reached

THE cold spell has put the brakes on the T-sums for the moment. Few averages of the daily maximum and minimum temperatures in the past week have finished on the plus side to be eligible for adding to the cumulative totals.

Only five more regions—the north-west coast in particular—reached T-sum 200 during the week. Many areas are poised above 170 degrees and several teeter on the brink—notably area 77 in the Thames Valley which stubbornly refuses to join its neighbours and has not budged from last week's 196.

A warm week, or even a day or so, will blacken the map considerably.

NEWS

'Cut national herd by 60,000'

THE national sow herd should be cut by 60,000 to current financial crisis, says a Ministry of Agriculture adviser with the Agricultural Development and Advisory Board.

Conversely, a cereals incorporation premium as supported by the farmers' unions would not solve the crisis, he told a North of Scotland College of Agriculture pig conference in Aberdeen.

"It would not be in the best interest of the pig industry as it would simply encourage producers to expand," he said.

And Mr Langrick voiced other Ministry criticisms of the pig industry. Producers had failed to match their increased technical efficiency with improved marketing, he claimed.

As a result, pigmeat consumption had fallen by 5.3 per cent and Britain had the lowest level of self-sufficiency in Europe.

"The industry and individual producers face serious decisions about realistic levels of pig production," he added.

"Producers have shied behind an assured market too long. They can no longer rely on increased consumer demand or even an increased share of the home market."

On the production side, Langrick suggested that producers were making too much of increased feed costs which had gone up by only 10 per cent in the past two years compared with 45 per cent wages and 40 per cent for fuel and maintenance.

In addition, many units were over-capitalised as a result of high investment in new buildings.

Winscale: No alarm

CLAIMS that cancer deaths rose because of a radioactive leak in 1957 at the Winscale atomic energy plant in Cumbria have failed to alarm dairy farmers in the region.

They believe that all safeguards were taken at the time and that these have continued. Regular meetings are held with officials from the plant.

The Government's radiation watchdog, the National Radiological Protection Board, in a special report on the 1957 leak, said contaminated radio-iodine settled on pastures and was transmitted in milk supplies through dairy cows.

Young children drinking the milk at the time were most at risk, the report said. It believes that 260 cases of thyroid cancer, including 13 fatal cases, could have resulted from the leak.

But the operators, British Nuclear Fuels, reject this claim as a theoretical assumption which gives a totally distorted view.

Cumbria National Farmers' Union county chairman Peter Mitchell was, in 1957, on the Ministry of Agriculture's staff responsible for obtaining milk samples following the leak. He remembers milk being poured into the sea for six weeks after the accident.

"There was a great deal of concern at the time, but the feeling was that the authorities had things under control," he recalled. "Milk was immediately earmarked because of its early risk of contamination in the food chain."

Milk samples are still collected daily from farms within



Mr Albert Fawcett, whose doorstep of Winscale atom

a 10-mile radius of the plant is carefully analysed. Soil and grass samples as well as checks on vegetables and crops are also taken regularly.

All testing is overseen by the Ministry of Agriculture, which carries out its own independent surveillance of farms in the region. Both supplies of milk from farms and at dairies are sampled.

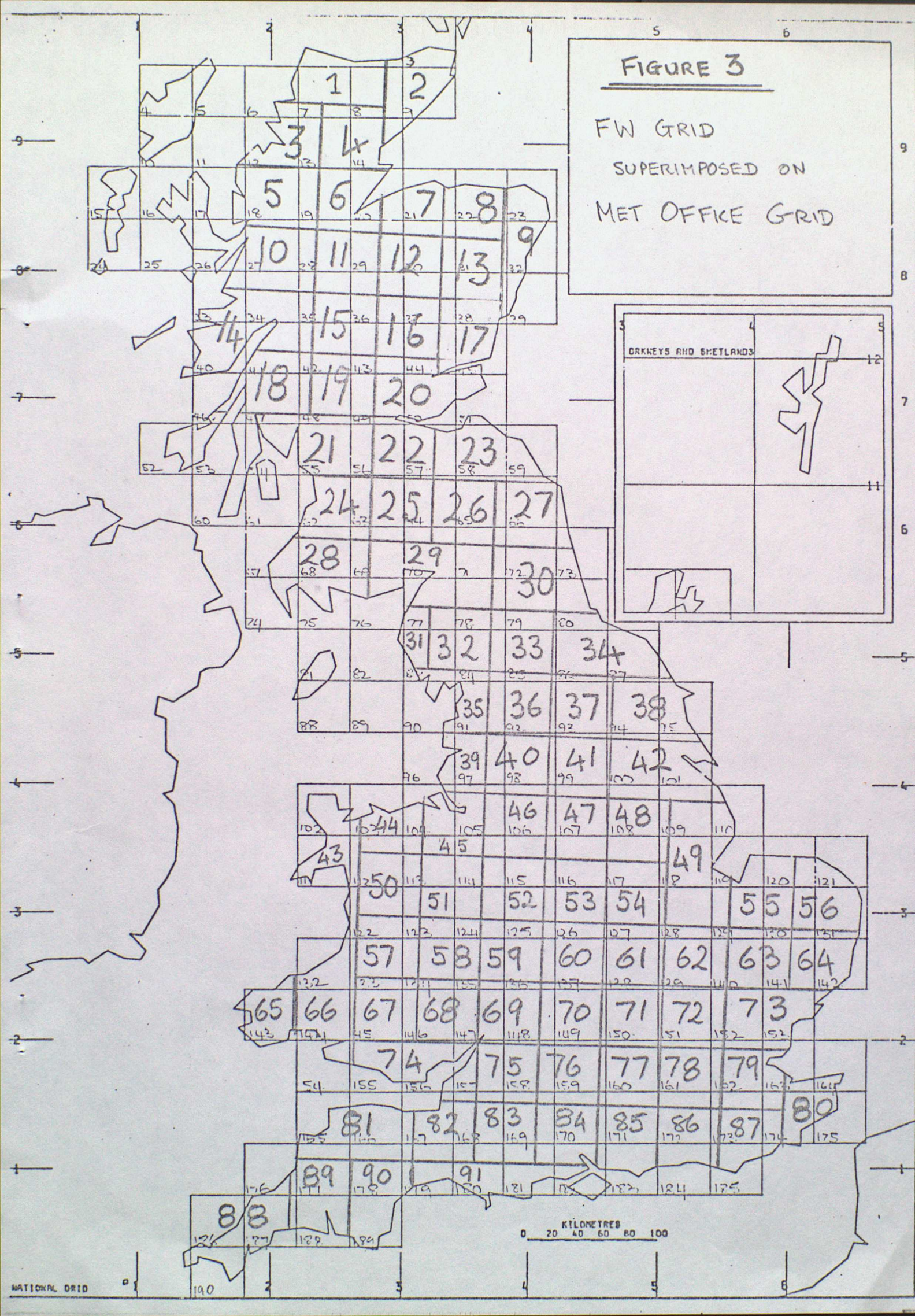
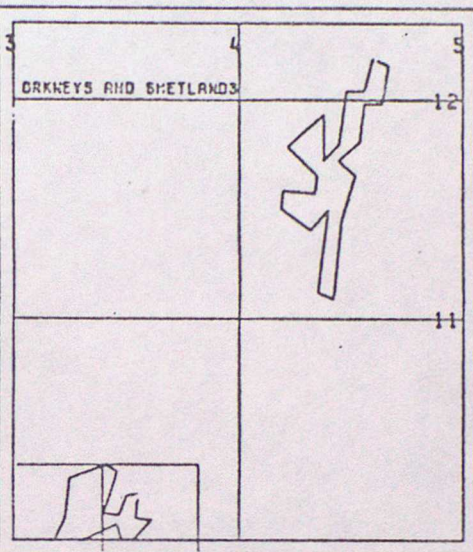
Mr John Fawcett, who lives at nearby Seascale Hall, says farmers kept up an average

FIGURE 3

FW GRID

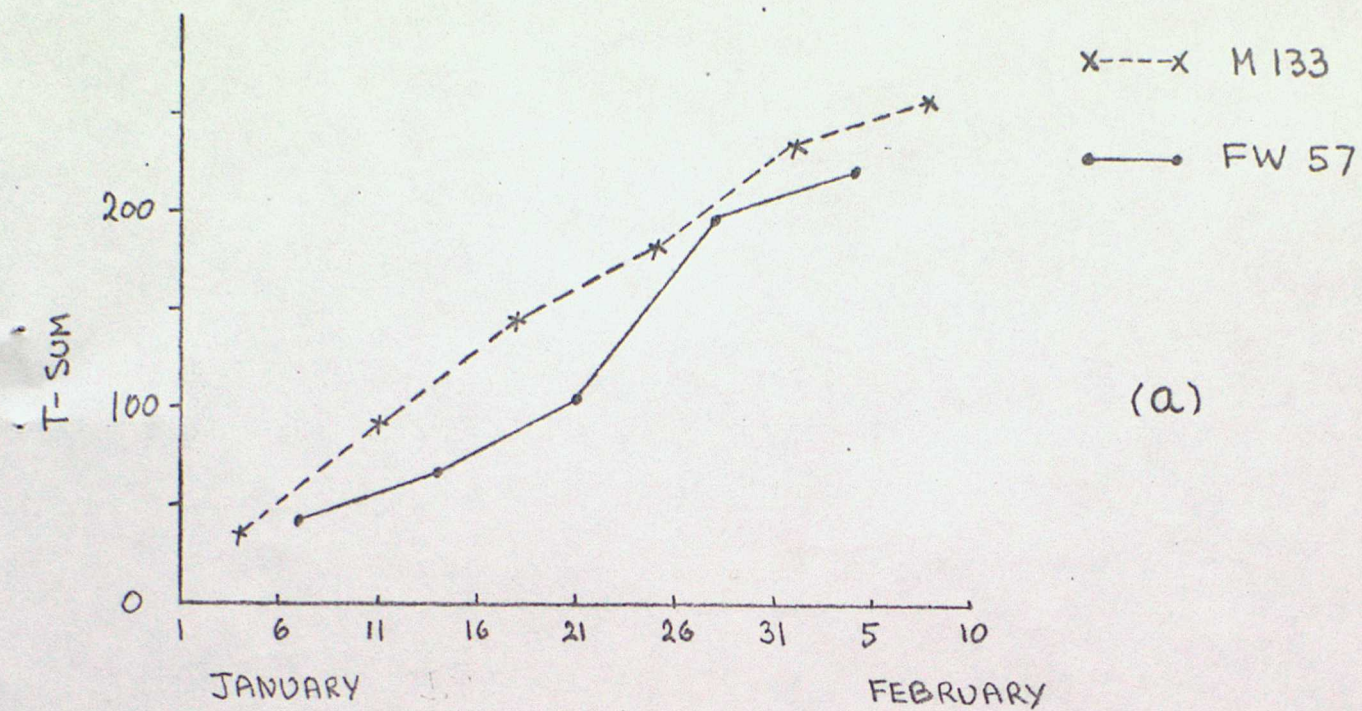
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MET OFFICE GRID

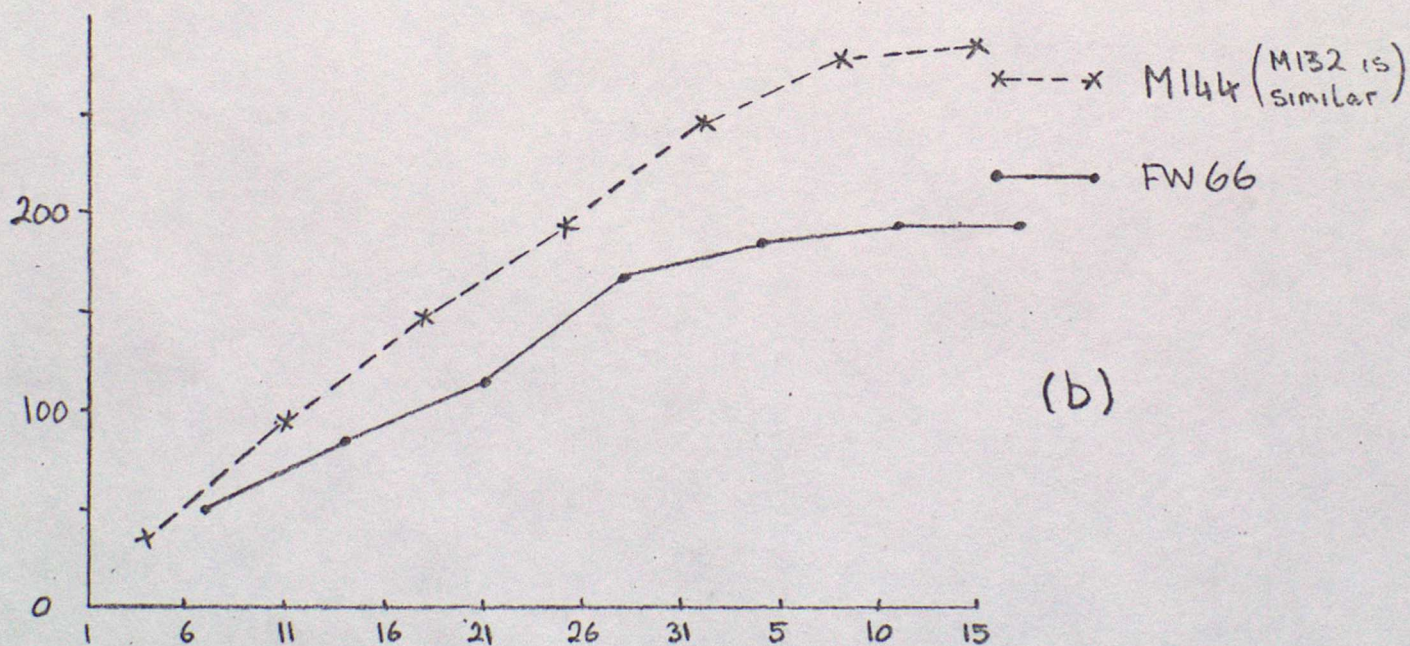


Key to Figure 4

Figure		MORECS SQUARE(S)		FW SQUARE(S)
	4a	133	compares	57
	b	144,132		66
	c	49,50,51		20
	d	32,39;23		9
	e	115;125		52
	f	166;165		81
	g	102,111		43
	h	134,135		58
	i	139		62
	j	142		64
	k	66		27
	l	85		33
	m	137		60
	n	148,147		69
	o	170		84
	p	131		56
	q	92		36
	r	122		50,57
	s	156		74
			with	



(a)



(b)

FIGURE 4a, b

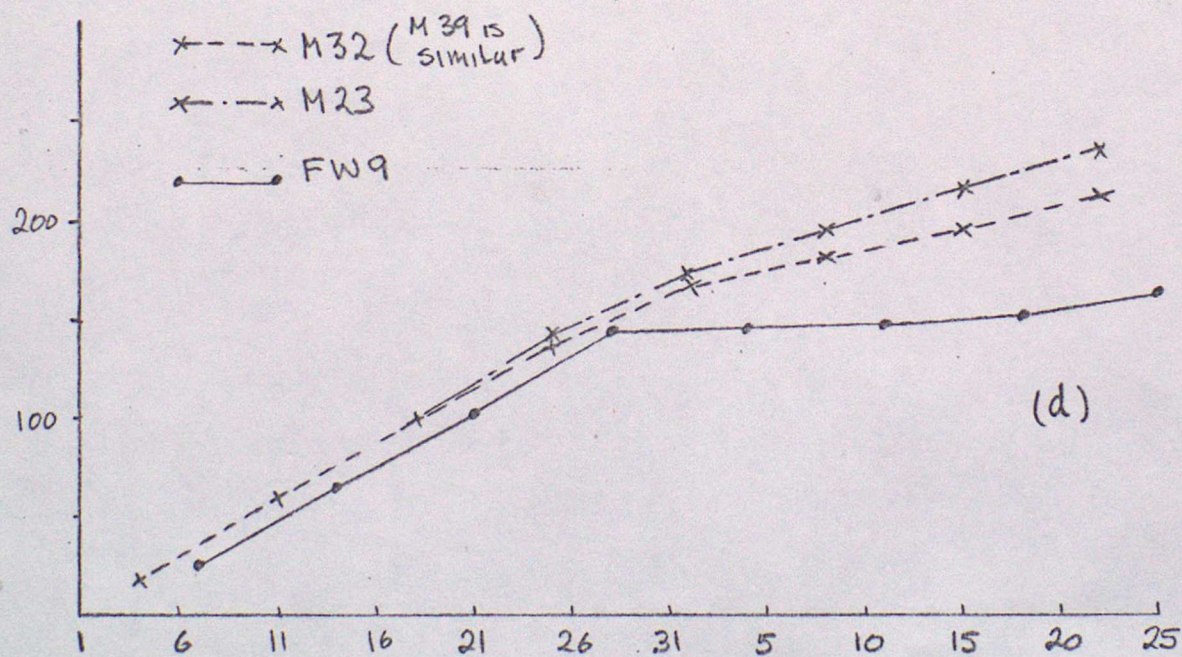
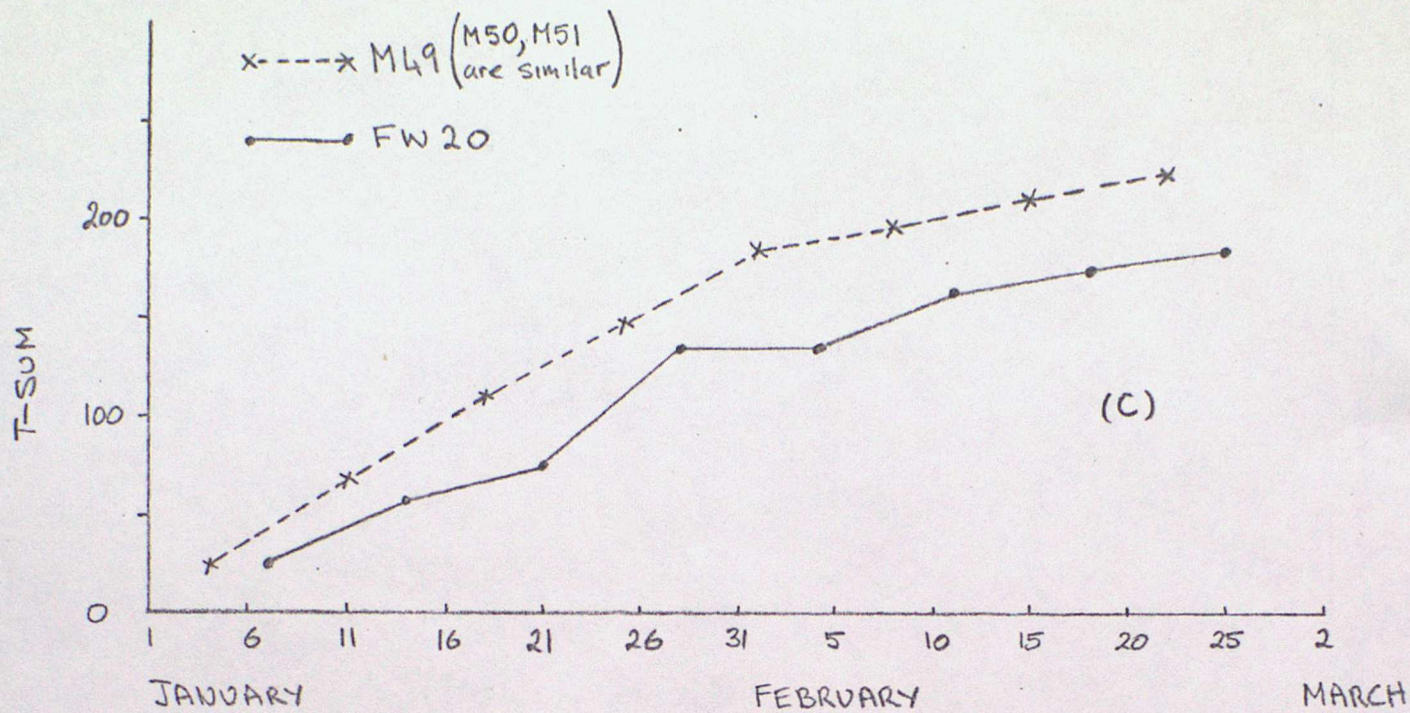


FIGURE 4c,d

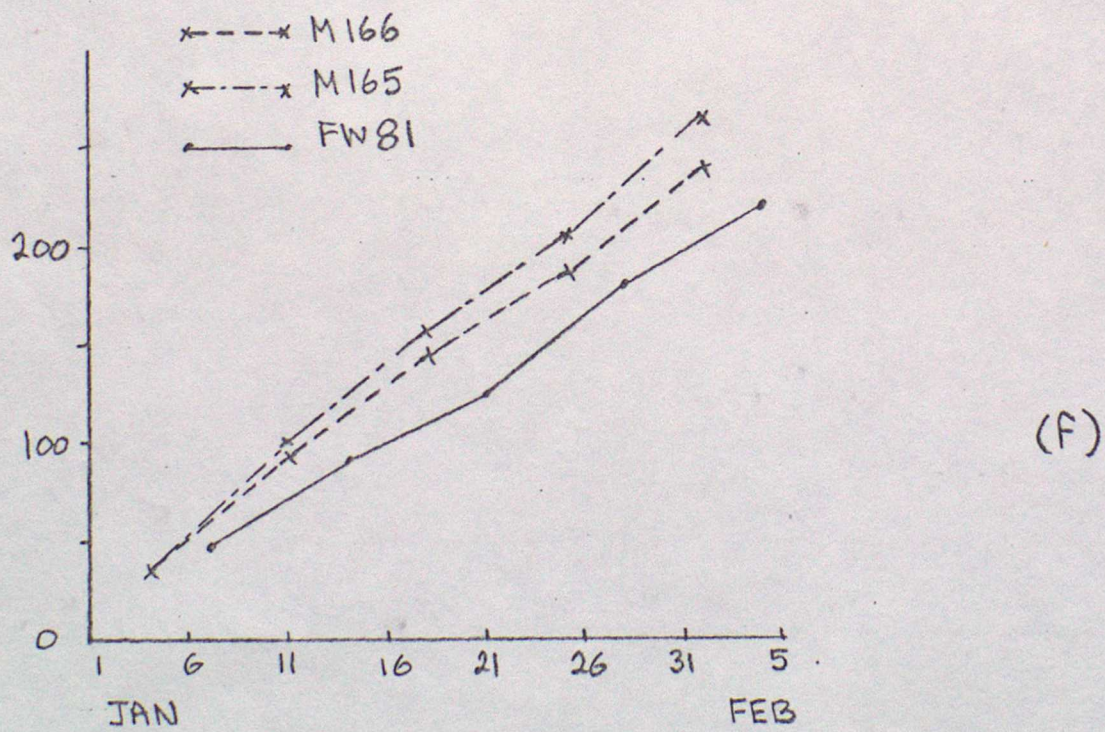
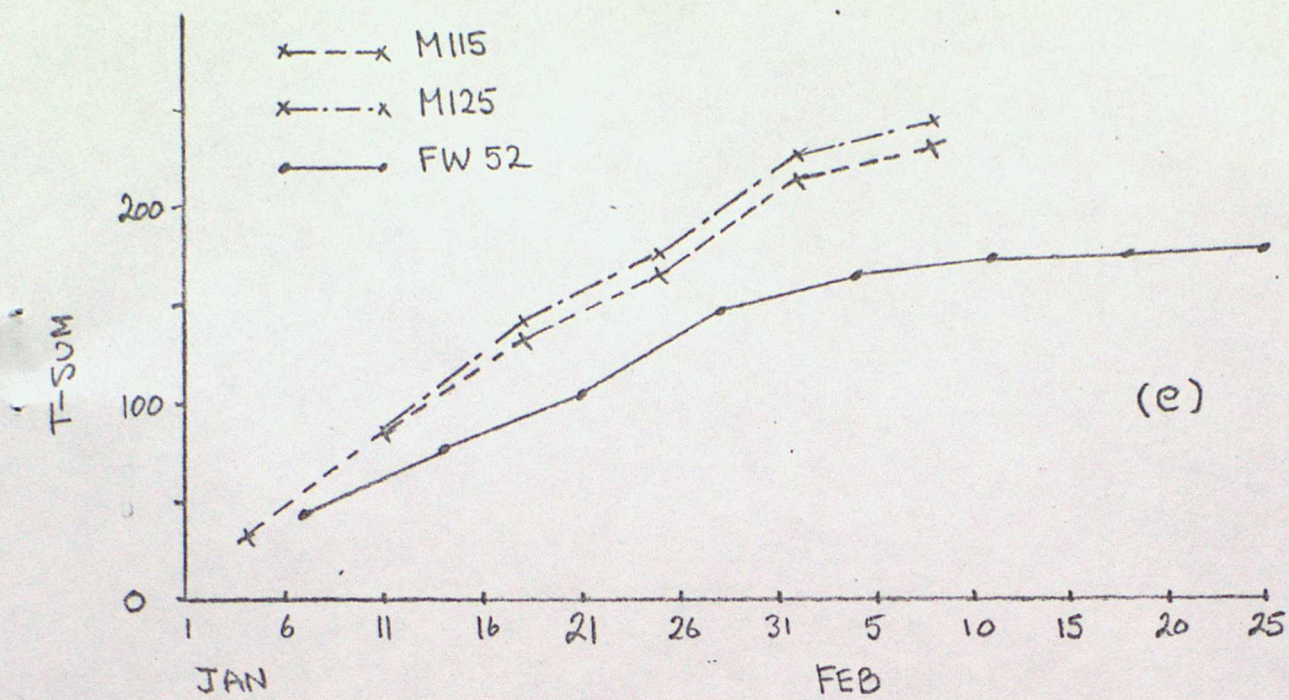


FIGURE 4 e, f

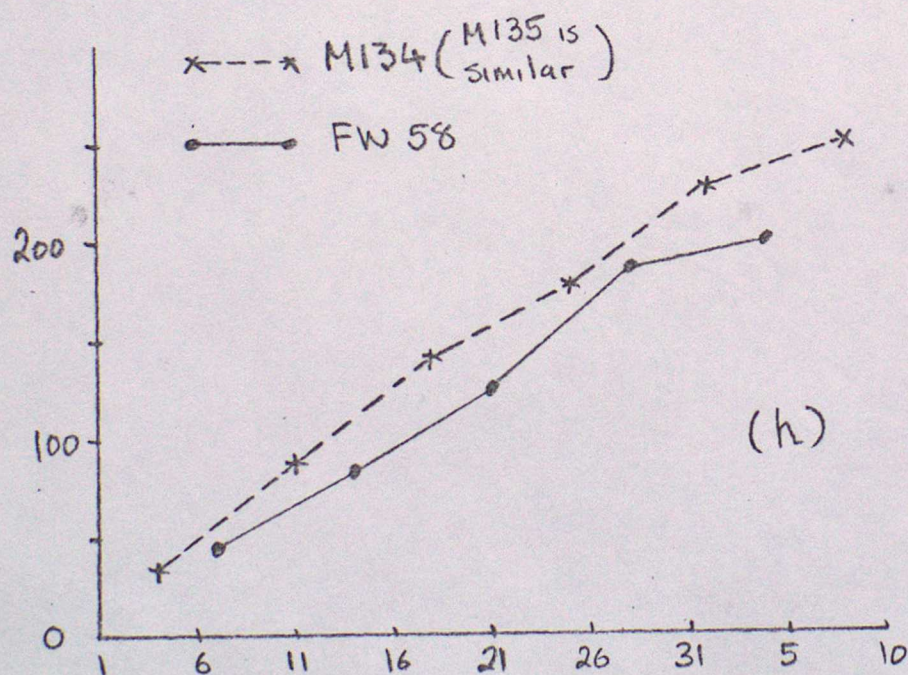
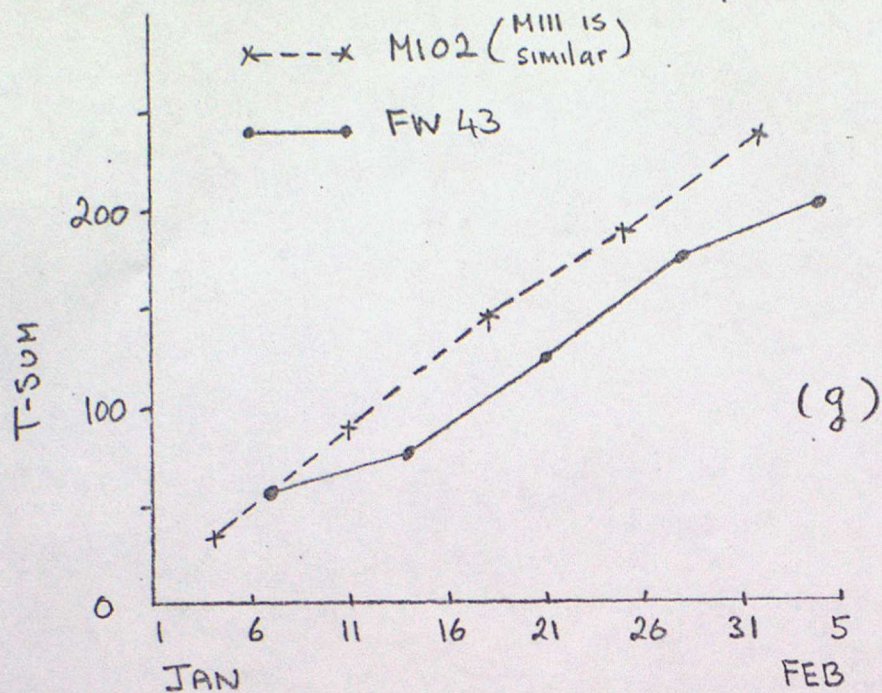


FIGURE 4 g, h

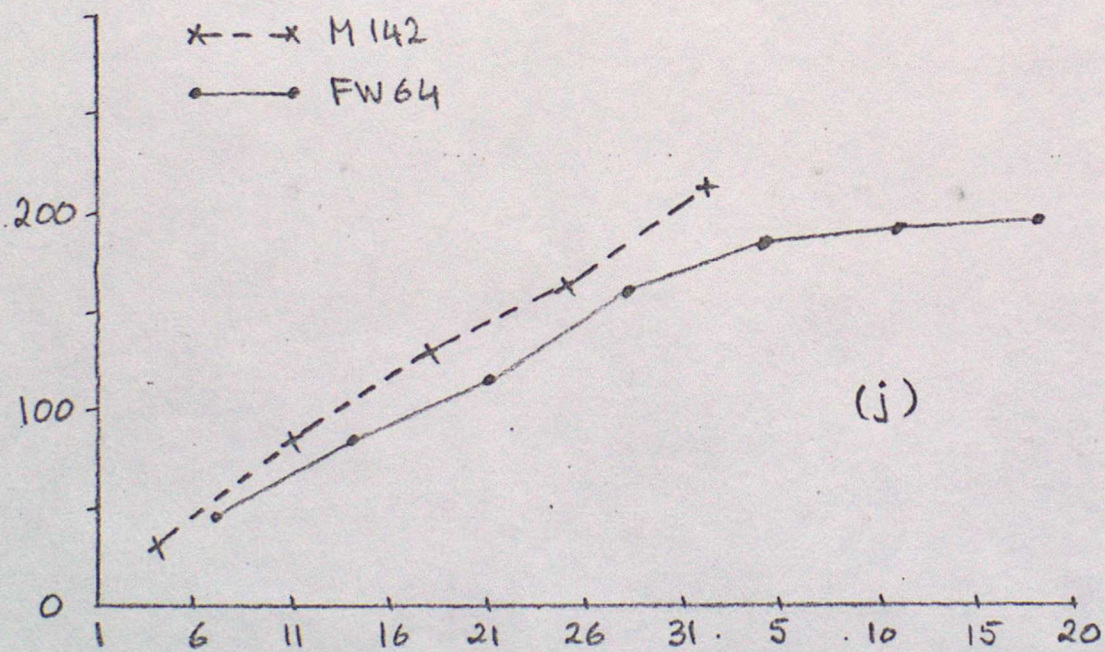
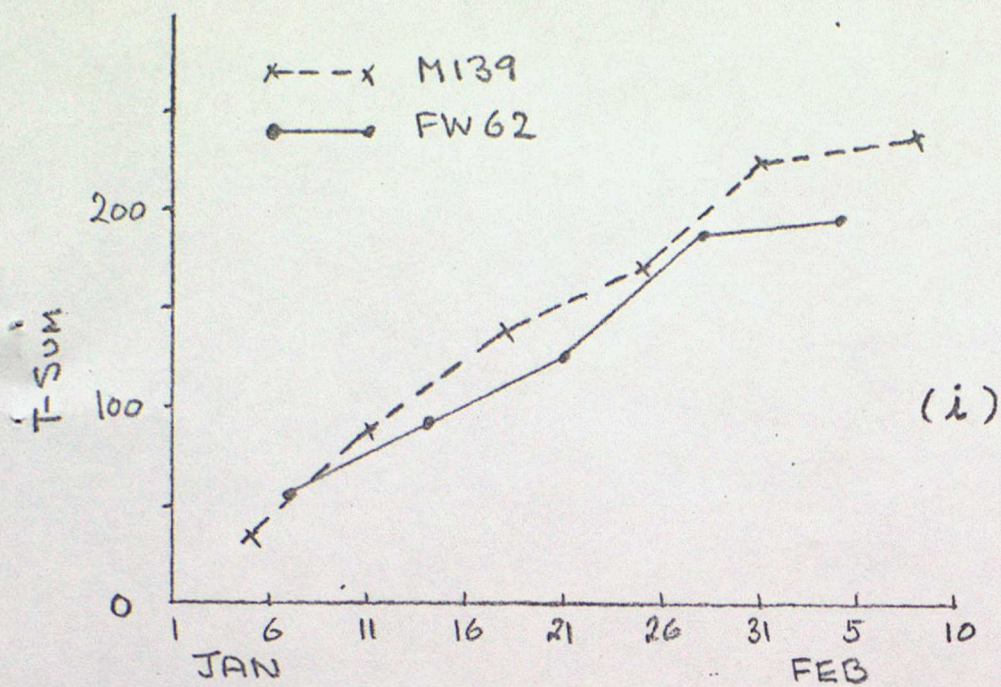


FIGURE 4 i, j

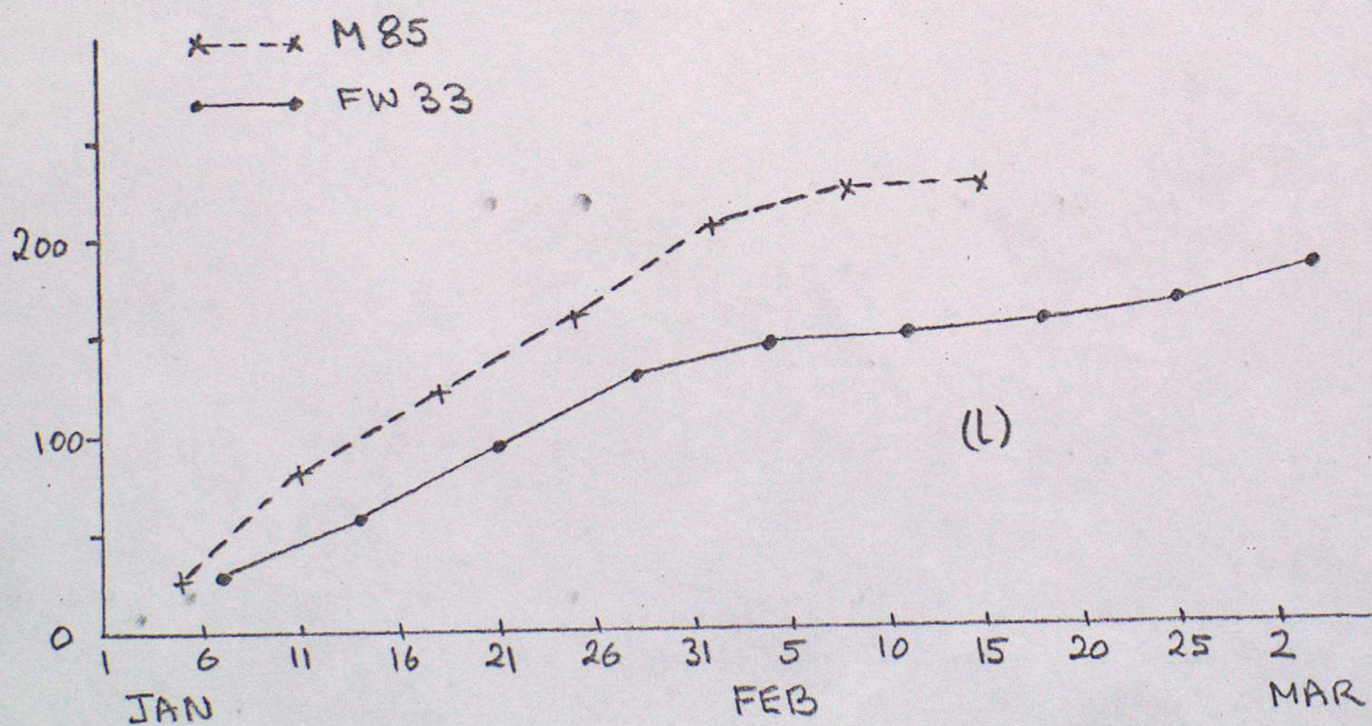
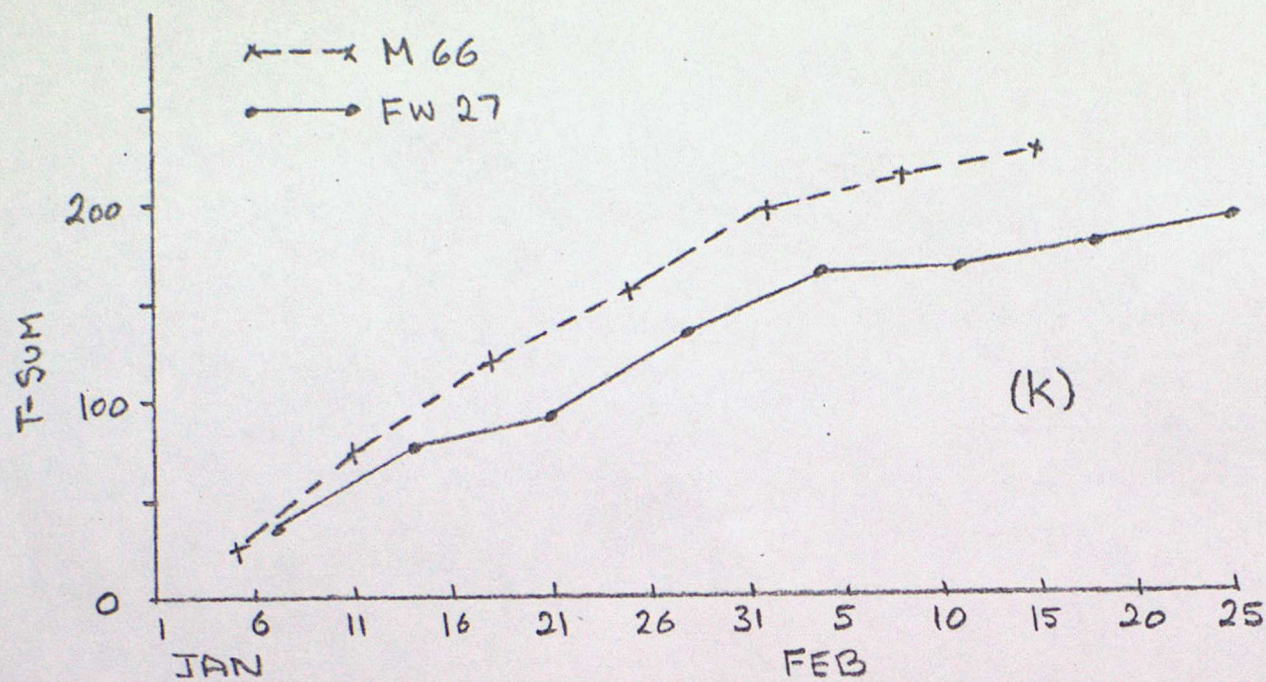


FIGURE 4 k,L

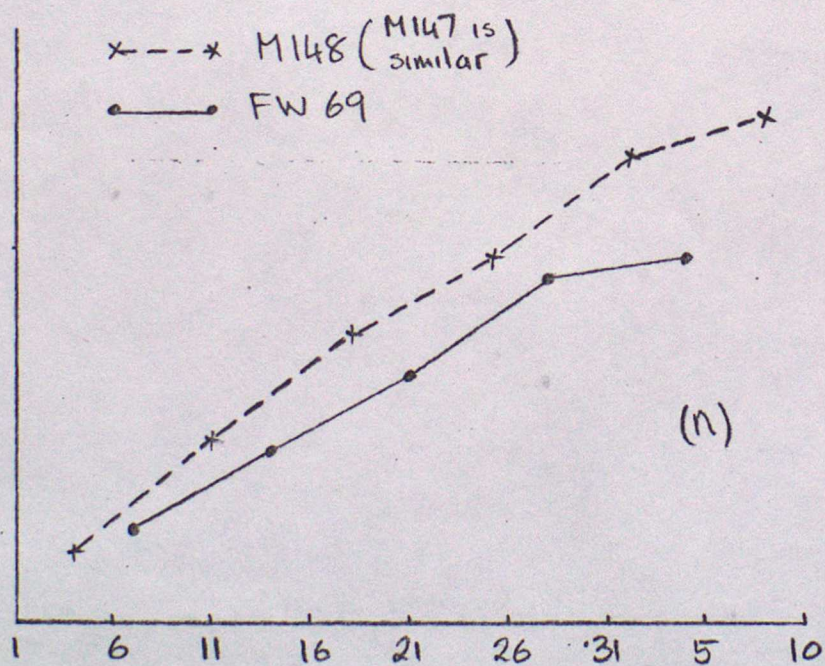
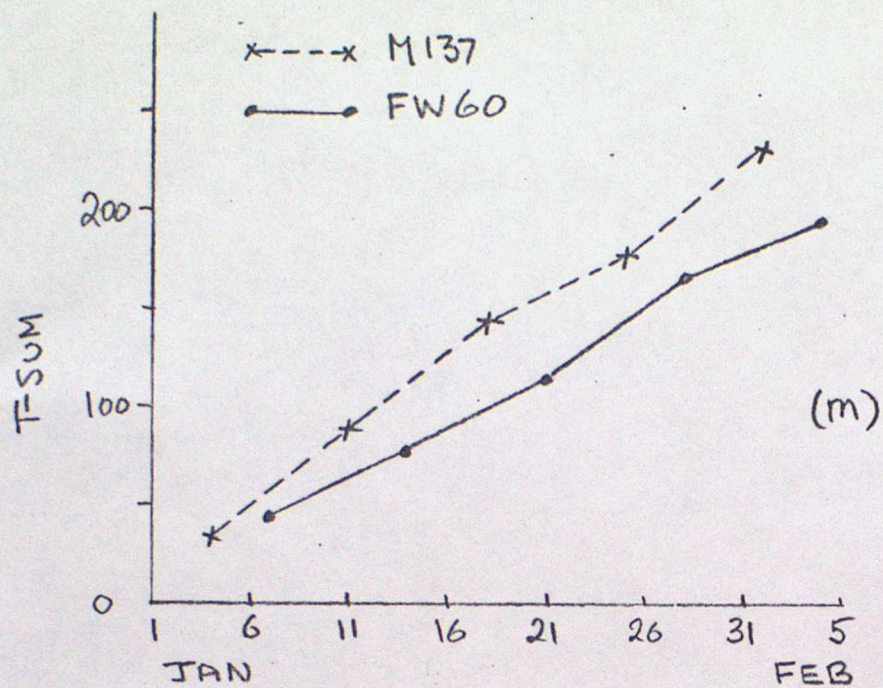


FIGURE 4 m, n

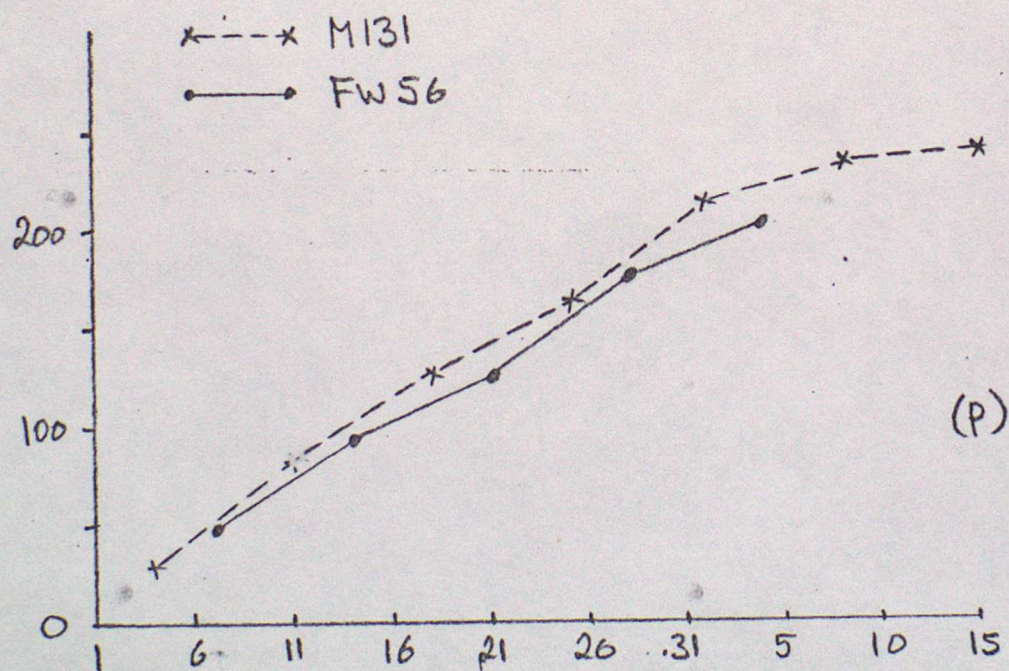
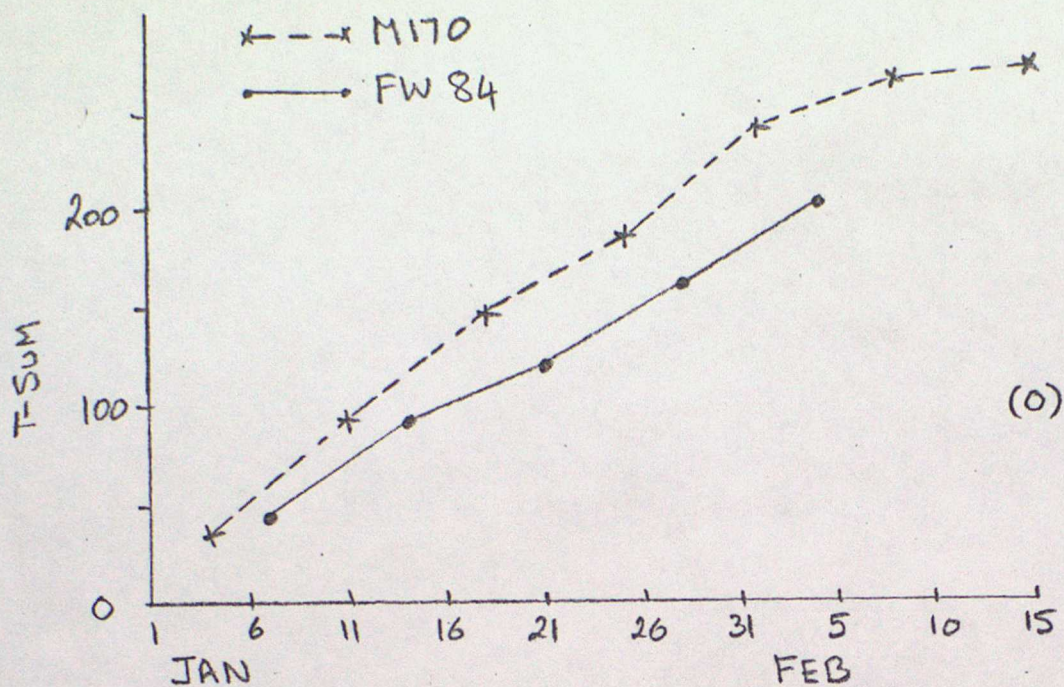


FIGURE 4 o, p

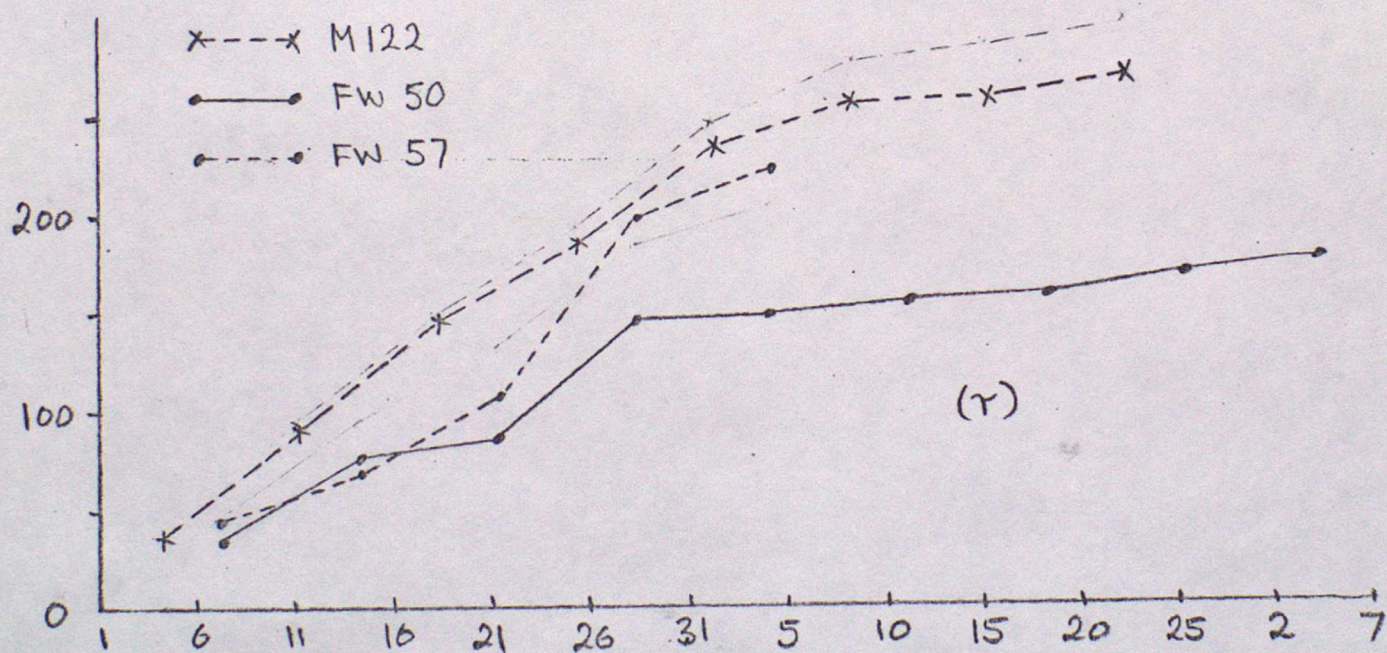
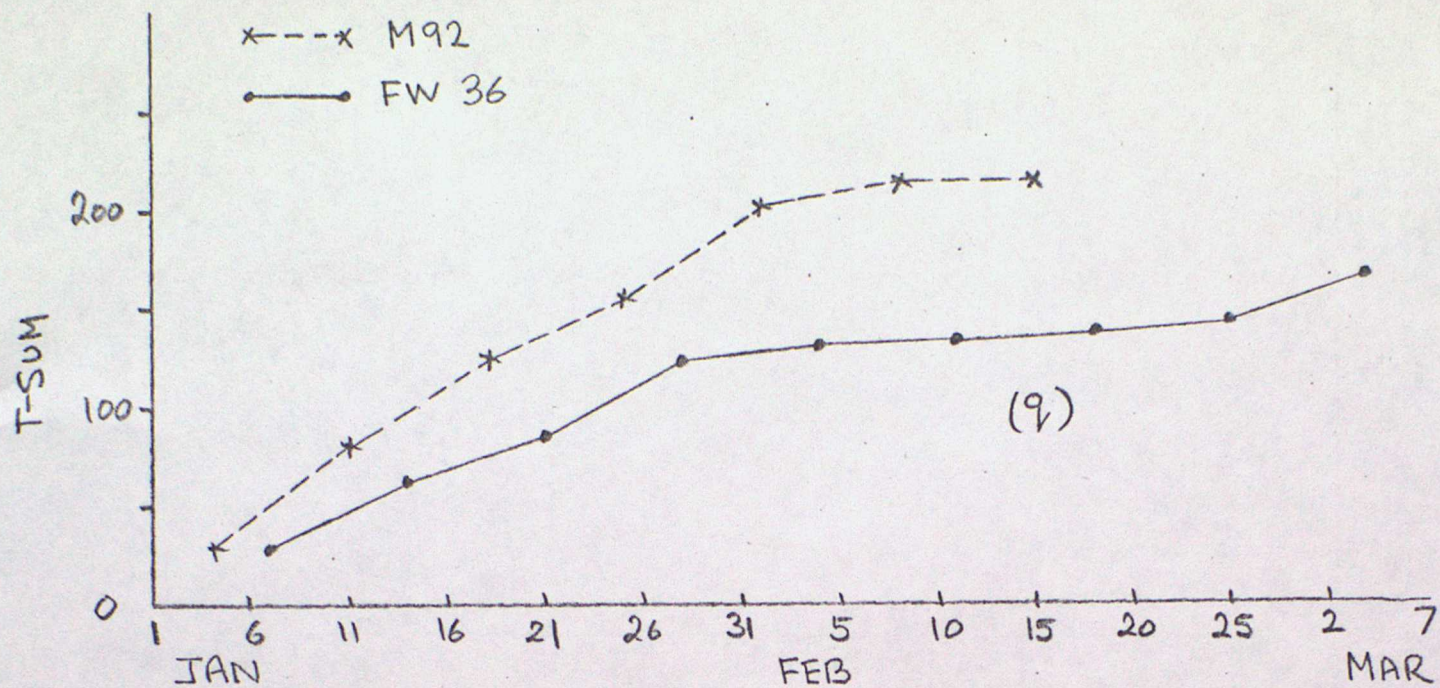


FIGURE 4 q, r

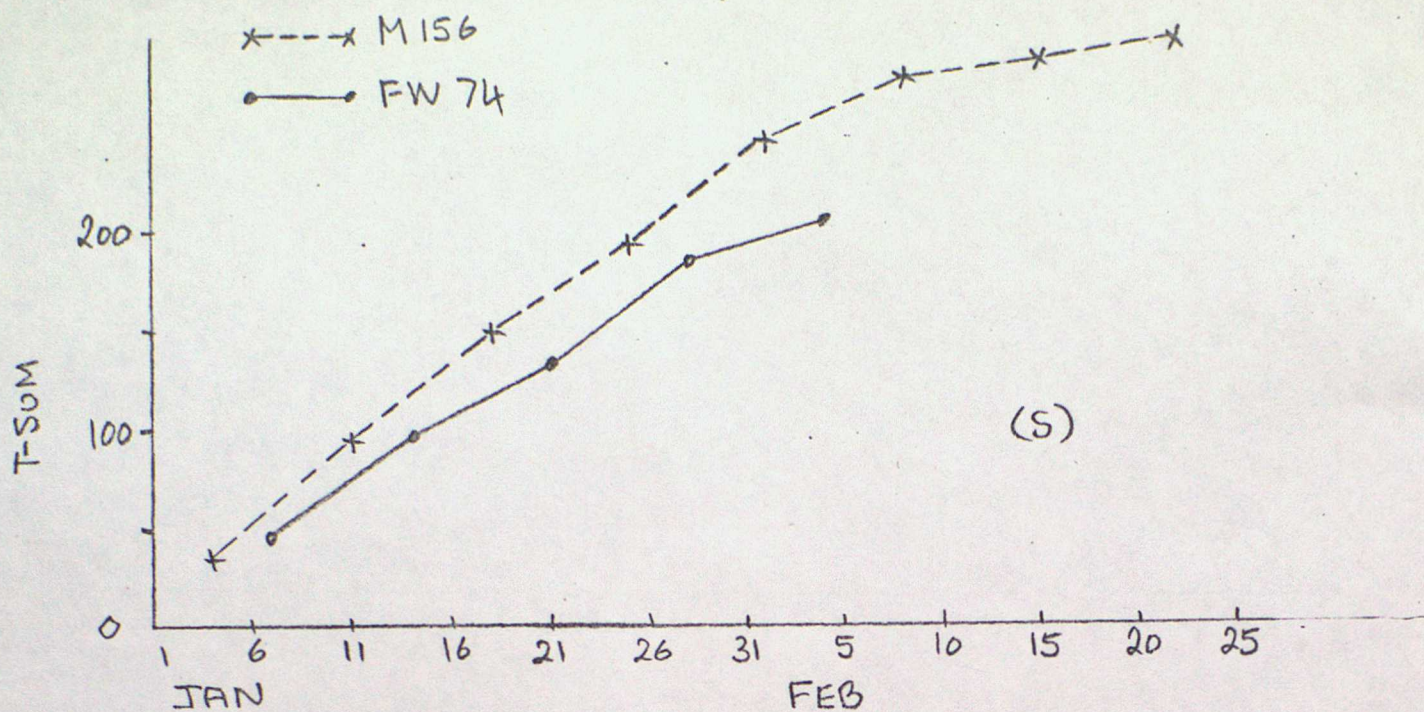


FIGURE 45

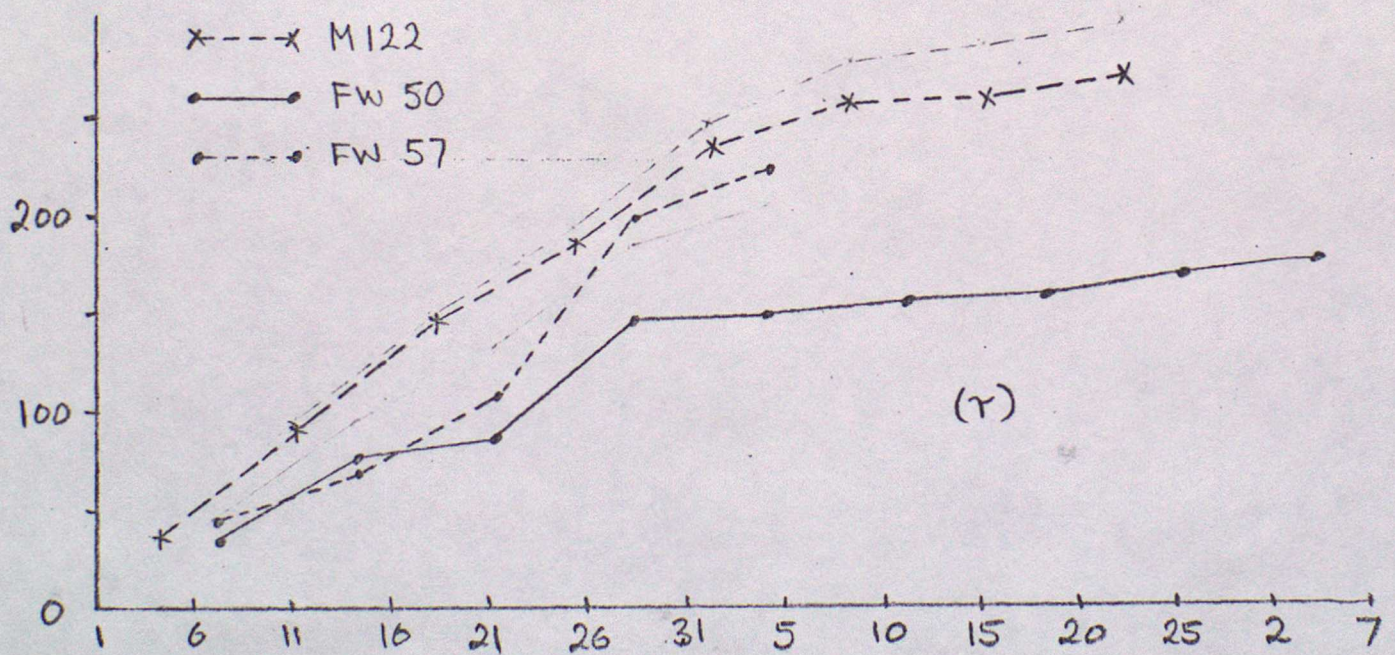
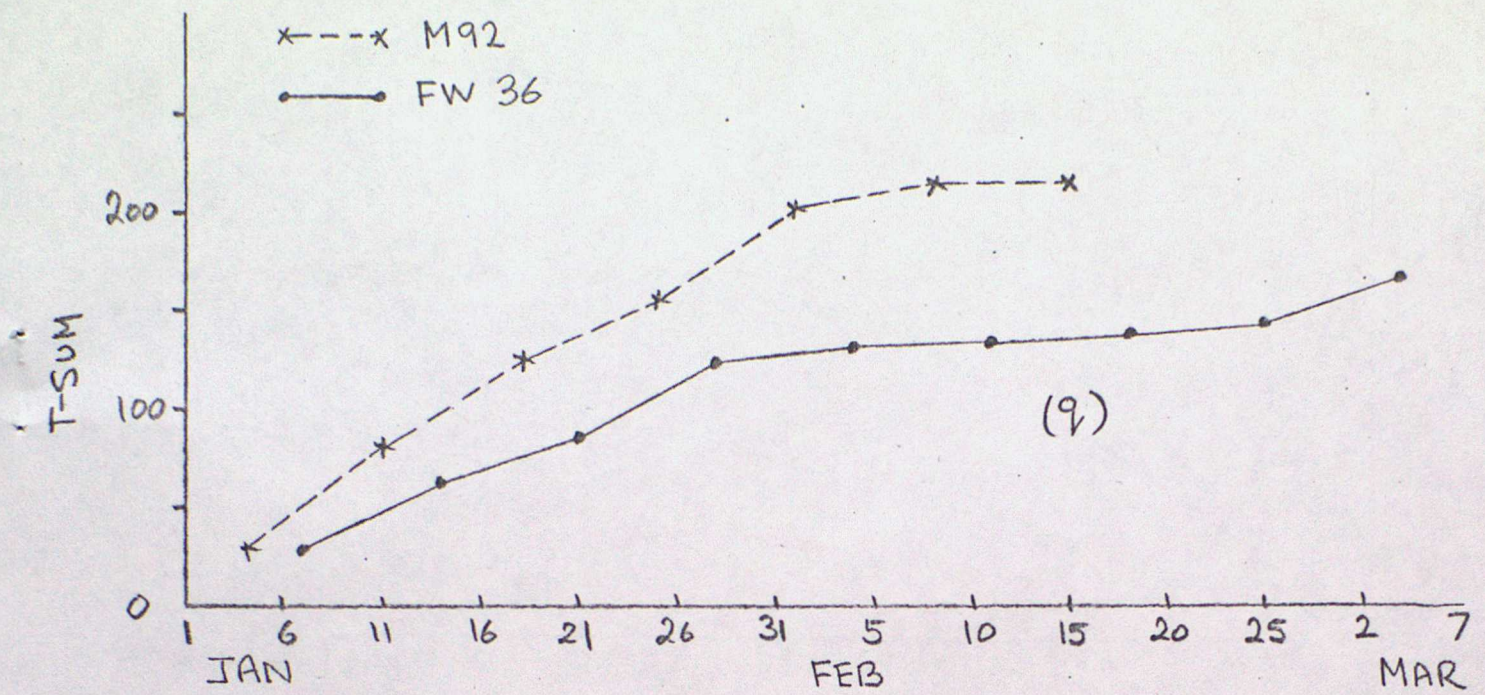


FIGURE 4 q, r

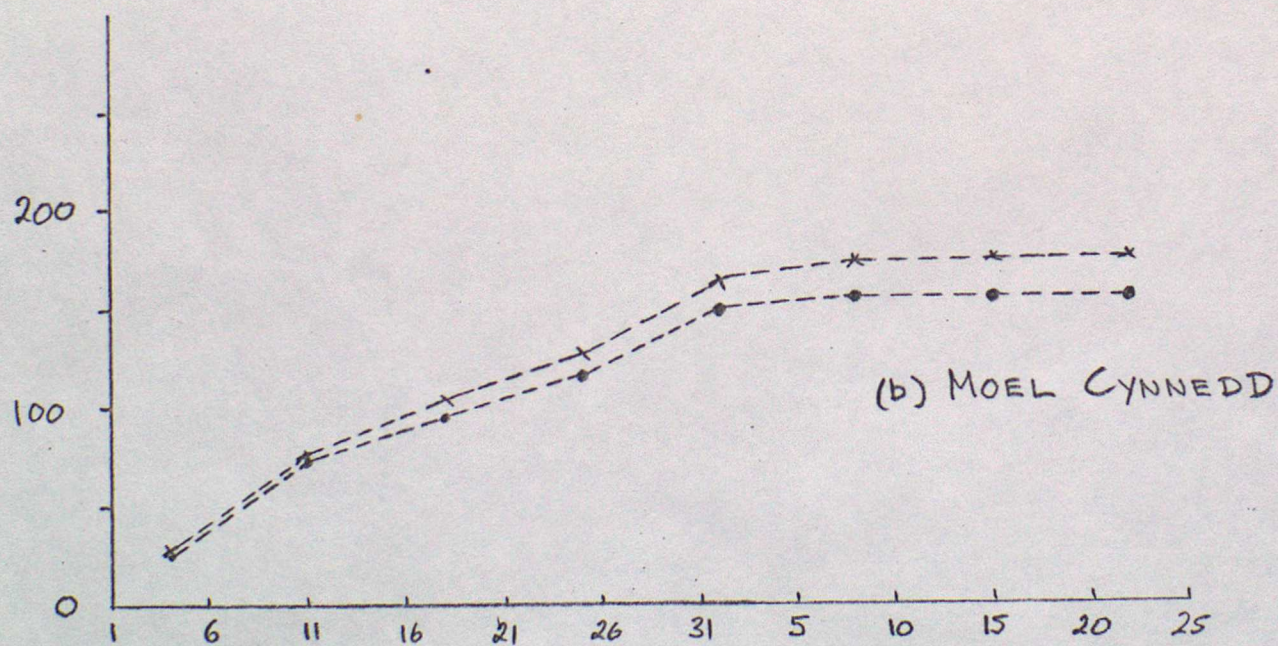
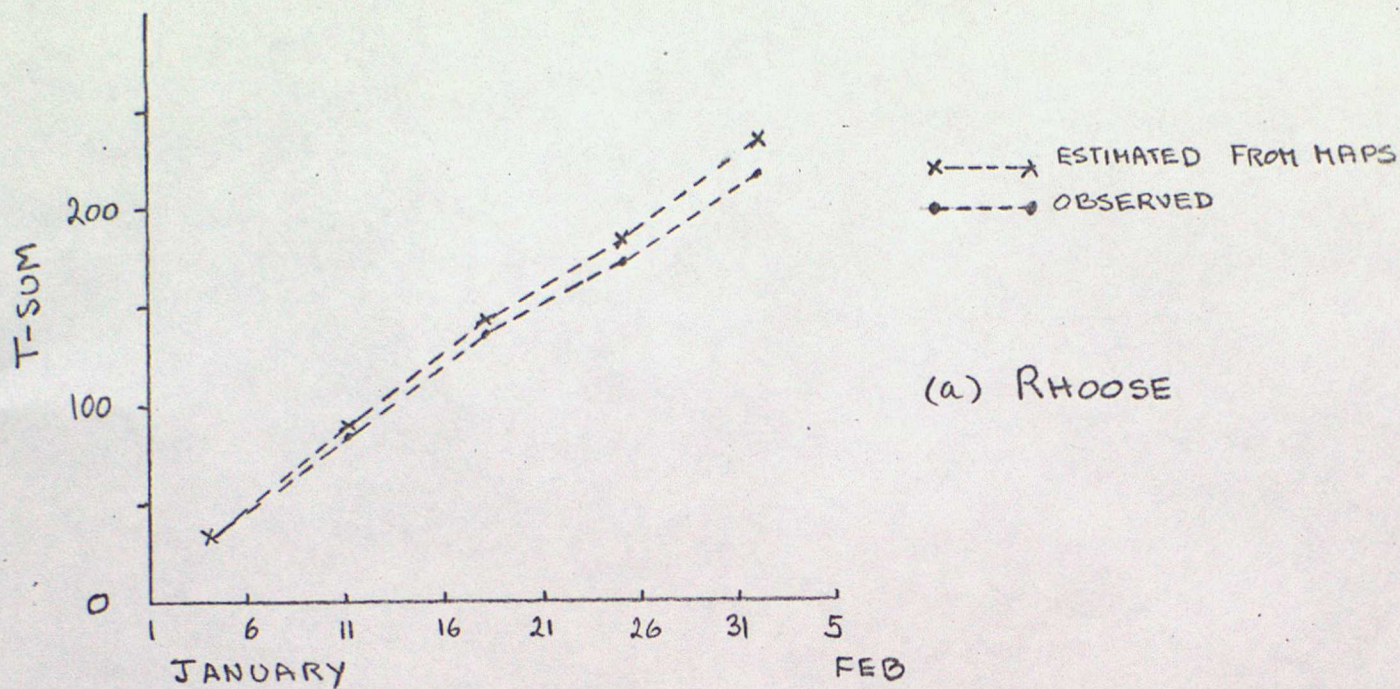


FIGURE 5